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Compiled by Hildegard Klein
ARC-Plant Protection Research Institute

2. BIOLOGICAL CONTROL OF INVASIVE CACTUS SPECIES (FAMILY CACTACEAE)

2.9 Jointed cactus *(Opuntia aurantiaca)*

ORIGIN OF THE WEED

Jointed cactus (fig.1) is indigenous to South America.

BIOCONTROL AGENTS

Read more about biological control in general in leaflet 1.3 in this series, and about biocontrol in cactus species in leaflet 2.1.

In South Africa, jointed cactus is controlled mainly by the cochineal, *Dactylopius austrinus*. The cactus moth, *Cactoblastis cactorum*, which was originally released to control prickly pear, also colonises jointed cactus, but only occasionally in such numbers as to have any real impact on the weed.

a. Jointed cactus cochineal, *Dactylopius austrinus*

Although jointed cactus does not occur in the natural range of *D. austrinus* in Central and Western Argentina, the insect thrives on this cactus species in other parts of the world where both the insect and cactus are introduced species. *D. austrinus* was first introduced into Australia in 1921 and subsequently into South Africa during 1935 to control jointed cactus, which is a major weed in both countries. It is host-specific and in South Africa it will only attack jointed cactus.

Background information on agent

Consult leaflet 2.2 in this series for essential information on the life cycle of this insect, its potential as biological control agent and its implementation.

Cochineal damage to jointed cactus

Feeding by the nymphs and adult females cause the cladodes of infested plants to yellow, rot and abscise (drop off) (fig. 2). About a year after cochineal has first infested a plant, most of the outer parts will have died and fallen to the ground, leaving only the hard, woody, main stems. These woody stems may take another six months to die (fig. 3). The insects also attack the underground tubers near the ground surface, and may kill smaller ones. Large tubers are more resistant and often survive the attack, allowing the plants to re-grow.

Cochineal is most damaging in dry areas and where there are high densities of jointed cactus plants. Typically under these conditions most of the plants can be destroyed within a few months, and the biomass of the cactus is drastically reduced. Most of the surviving plants are weakened and produce fewer new joints. Those joints that fall to the ground normally do not survive, and the plants hardly spread or propagate anymore.

Even when cochineal is present in an area, the cactus populations may increase above the acceptable thresholds at irregular intervals several years apart. This does not mean that biological control is ineffective but is the result of natural cycles of the populations of the plant and its natural enemy. When the density of jointed cactus increases in an area, the cochineal also become more abundant. Eventually, the insects proliferate to the extent that they cause a severe "crash" in the population of cactus.

At this stage, food for the cochineal becomes scarce and the plants are too widely spaced for effective dispersal of crawlers. The population of insects therefore also diminishes. The resulting scarcity of cochineal allows the jointed cactus populations to recover, and the cycle is repeated. The number of years between one resurgence and the next depends mainly on weather conditions. In the Eastern Cape, the cycles are typically of 5 to 7 years' duration.

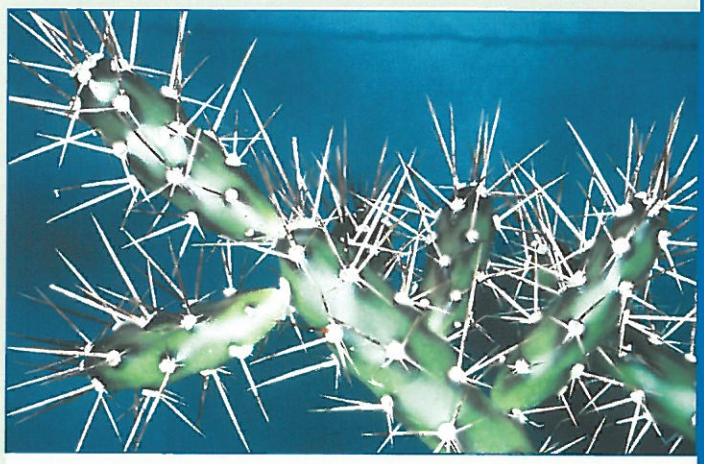

Figure 1. Jointed cactus.

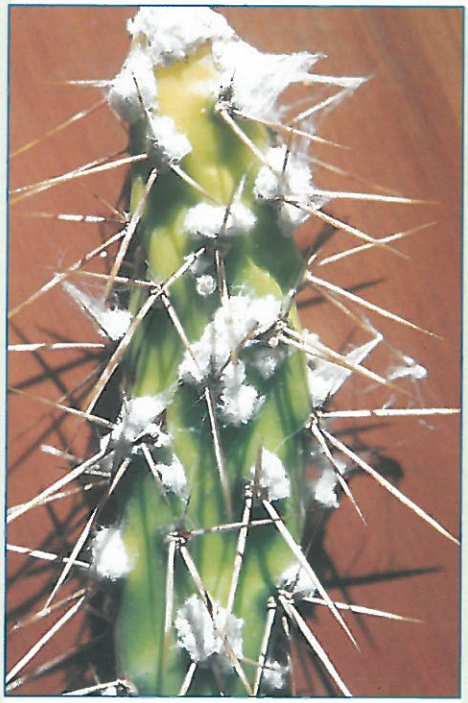

Figure 2. A cladode of jointed cactus infested by cochineal.

At its highest level, the cactus population is typically between 25 and 50 cladodes/m^2. Although this density of plants may appear alarming to the landowner, jointed cactus at this density hardly affects grazing and the wellbeing of stock. Because the highest population levels seldom persist for more than two years, the situation should be left for the insects to rectify, provided a good inoculum of the insect is always present.

2.9 Jointed cactus *(Opuntia aurantiaca)*

In sparse jointed cactus infestations the cochineal population sometimes becomes so low that a new inoculum of the insect has to be introduced from cochineal-infested cactus patches in the area. If jointed cactus infestations are dense or of medium density, it will not be necessary to supplement the cochineal population, even if only few insects are left.

b. Cactus moth, *Cactoblastis cactorum*

This moth, native to Argentina, Uruguay, Paraguay and the southern part of Brazil, was released in South Africa in 1933 for the biological control of prickly pear (*Opuntia ficus-indica*), after which it also colonised jointed cactus. It is of lesser importance in the control of jointed cactus.

Background information on agent

Consult leaflet 2.3 in this series for essential information on the life cycle of this insect, its potential as biological control agent and its implementation.

Damage by the cactus moth to jointed cactus

Under ideal circumstances, the feeding larvae hollow out and destroy the cladodes (fig. 4). The plants are usually damaged even more by microbial pathogens that enter the wounds and cause secondary infections. Heavily attacked plants may be killed, but this does not often happen in South Africa. Only rarely does the cactus moth contribute significantly towards the biological control of jointed cactus in South Africa.

Figure 3. Jointed cactus devastated by cochineal.

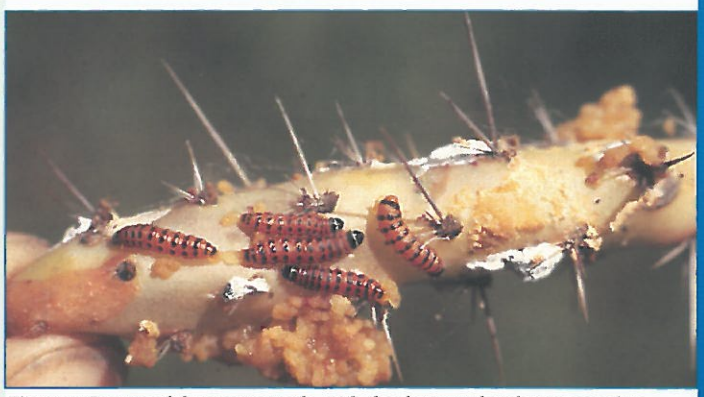

Figure 4. Larvae of the cactus moth, with the damage they have caused to jointed cactus.

CONTROL STRATEGY	
All cactus infestations	Ensure that sufficient cochineal is present continuously and redistribute regularly
In dry areas or during prolonged dry periods	Biological control only - cochineal (and cactus moth)
In high-rainfall areas	Integrate biological and chemical control. Rely on biological control during dry periods - cochineal (and cactus moth). Chemical control during wet periods - MSMA
Dense cactus infestations	Biological control - cochineal (and cactus moth). Establish cochineal at intervals of about 50 m, but in the case of more widely scattered plants, each plant should be infested individually. If necessary, MSMA can be used as follow-up after the largest part of the infestation has been killed by cochineal.
Large, single cactus plants	Chemical control - e.g. MSMA
Small groups of cactus	Chemical control - e.g. MSMA
Small cactus plants and loose joints	Collect, stack and treat with MSMA. Most will die naturally from desiccation.

CONTACT PERSONS

Consult leaflet 1.4 for the most updated contact details.

- Biocontrol research: Weeds Research Division, ARC-PPRI (Rietondale), Private Bag X134, Pretoria 0001; Tel (012) 329 3269; Fax (012) 329 3278; e-mail weeds@plant2.agric.za.
- Chemical control and supply of biocontrol agents: National Department of Agriculture: Directorate of Agricultural Land Resource Management (D:LRM): your nearest Provincial Office.

ISBN 1-86849-175-7

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Page design: Sanet du Plessis. This leaflet was printed by United Litho, with financial assistance from the *Working for Water* Programme of the Department of Water Affairs and Forestry and the National Department of Agriculture
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